CLAIMS

What is claimed is:

1. A procedure for shutting down an operating fuel cell system, wherein, during operation of the fuel cell system, a continuous flow of air is being provided to a fuel cell cathode from an oxidant source through a cathode flow field on one side of an electrolyte, and a continuous flow of fresh hydrogen containing fuel is being provided to a fuel cell anode from a fuel source through an anode flow field on the other side of the electrolyte, and an electric current is being generated by the fuel cell within an external circuit and is operating a primary electricity using device in the external circuit, the procedure including the following steps:

(A) disconnecting the primary electricity using device from the external circuit and stopping the flow of fresh fuel from the fuel source to the anode flow field; and, then

(B) displacing the fuel remaining within the anode flow field with air by blowing air into and through the anode flow field while venting the anode flow field exhaust.

2. The shut down procedure according to claim 1, wherein after step (A) and before step (B), connecting an auxiliary resistive load for a period of time across the anode and cathode in an external circuit.

3. The shut-down procedure according to claim 2, wherein the auxiliary load is applied until the cell voltage is reduced to about 0.2 volts or less.

4. The shut-down procedure according to claim 2, wherein the auxiliary load is applied until the cell voltage is reduced by 0.1 volt or more prior before step (B).

5. The shut-down procedure according to claim 2, wherein the size of the applied auxiliary load is selected to reduce the cell voltage to about 0.2 volts or less in less than 1.0 minute.

6. The shut-down procedure according to claim 5, wherein the auxiliary load continues to be applied during step B.

7. The shut-down procedure according to claim 2, wherein during the application of the auxiliary load a flow of air is maintained through the cathode flow field.

8. The shut-down procedure according to claim 1, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 1.0 second.

9. The shut-down procedure according to claim 8, wherein the front of air moves through the anode flow field in less than 0.2 seconds.

10. The shut-down procedure according to claim 9, wherein the front of air moves through the anode flow field in less than 0.05 seconds.

11. The shut-down procedure according to claim 9, wherein the flow of air to the cathode flow field is stopped during the time the said front of air is moving through the anode flow field.

12. The shut-down procedure according to claim 2, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 1.0 second.

13. The shut-down procedure according to claim 12, wherein the air front moves through the anode flow field in less than 0.2 seconds.

14. The shut-down procedure according to claim 12, wherein the air front moves through the anode flow field in less than 0.05 seconds.

15. The shut-down procedure according to claim 1, wherein, during normal fuel cell operation under load, a recycle blower within a recycle loop recirculates at least a portion of the anode flow field exhaust through the anode flow field; and wherein in step (B) the air is blown into and through the anode flow field using the recycle blower and without recirculating the anode exhaust.

16. The shut down procedure according to claim 15, wherein after step (A) and before step (B), connecting an auxiliary resistive load across the anode and cathode in an external circuit.

17. The shut-down procedure according to claim 16, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 1.0 seconds.

18. The shut-down procedure according to claim 16, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 0.2 seconds.

19. The shut-down procedure according to claim 18, wherein the step of displacing the fuel comprises moving a front of air through the anode flow field in less than 0.05 seconds.

20. The shut-down procedure according to claim 19, wherein the auxiliary load is applied until the cell voltage is reduced to about 0.2 volts or less.

21. The shut-down procedure according to claim 17, wherein the auxiliary load is applied until the cell voltage is reduced by at least 0.1 volt before step (B).

22. The shut-down procedure according to claim 20, wherein the auxiliary load continues to be applied during at least a portion of step (B).

23. The shut-down procedure according to claim 21, wherein the auxiliary load continues to be applied during at least a portion of step (B).

24. The shut-down procedure according to claim 20, wherein the auxiliary load continues to be applied during step B until all the fuel has been displaced.